

What is claimed is:

1. A pattern drawing apparatus for forming exposure patterns, that have a mirror image relationship to each other with respect to a substrate, on both sides  
5 of the substrate, comprising:

maskless exposure means for forming the exposure patterns on both sides of the substrate by masklessly exposing both sides of the substrate in accordance with prescribed data.

10 2. A pattern drawing apparatus as claimed in claim 1, wherein the maskless exposure means includes exposure heads arranged facing each other, and wherein

the substrate is placed with each side thereof facing a corresponding one of the exposure heads  
15 so that both sides of the substrate are masklessly exposed.

3. A pattern drawing apparatus as claimed in claim 1, further comprising:

detecting means for detecting a  
20 displacement from the mirror image relationship of the exposure patterns by using a test substrate on both sides of which the exposure patterns are formed by the maskless exposure means; and

correcting means for correcting exposure  
25 data based on the displacement detected by the detecting means so that the mirror image relationship will be maintained between the exposure patterns when the exposure patterns are formed on both sides of the substrate by maskless exposure by the maskless exposure  
30 means in accordance with the exposure data.

4. A pattern drawing apparatus as claimed in claim 3, wherein the detecting means includes a developing means for developing both sides of the test substrate after maskless exposure, and wherein

35 the detecting means detects the displacement from the mirror image relationship by reading the exposure patterns that are formed on both

sides of the test substrate by the developing means.

5. A pattern drawing apparatus as claimed in claim 4, wherein the detecting means includes:

5 image capturing means for capturing images on the test substrate from one side thereof; and

control means for controlling the test substrate in such a manner as to block light during the exposure by the exposure means and to transmit light during the image capturing by the image capturing means.

10 6. A pattern drawing apparatus as claimed in claim 5, wherein the test substrate comprises a liquid crystal panel having a structure such that light projected from an exposure light source is prevented from being transmitted through the liquid crystal panel during the exposure by the exposure means, and such that  
15 transmittance to inspection light is high during the image capturing by the image capturing means.

7. A pattern drawing apparatus as claimed in claim 4, wherein the detecting means includes an image  
20 capturing means for capturing images on the test substrate from one side thereof, and wherein

the test substrate blocks light during the exposure by the exposure means and transmits light during the image capturing by the image capturing means.

25 8. A pattern drawing apparatus as claimed in claim 7, wherein the test substrate comprises a liquid crystal panel having a structure such that light projected from an exposure light source is prevented from being transmitted through the liquid crystal panel during the exposure by the exposure means, and such that  
30 transmittance to inspection light is high during the image capturing by the image capturing means.

9. A pattern drawing apparatus as claimed in claim 1, wherein the exposure patterns are lead patterns of a  
35 leadframe member.

10. A pattern drawing apparatus for forming resist patterns that have a mirror image relationship to each

other with respect to a substrate on both sides of the substrate, comprising:

inkjet patterning means for forming the resist patterns on both sides of the substrate by drawing  
5 the patterns by inkjetting on both sides of the substrate in accordance with prescribed data.

11. A pattern drawing apparatus as claimed in claim 10, wherein the inkjet patterning means includes inkjet heads arranged facing each other, and wherein  
10 the substrate is placed with each side thereof facing a corresponding one of the inkjet heads so that the resist patterns are drawn on both sides of the substrate.

12. A pattern drawing apparatus as claimed in claim  
15 10, further comprising:

detecting means for detecting a displacement from the mirror image relationship of the resist patterns by using a test substrate on both sides of which the resist patterns are formed by the inkjet  
20 patterning means; and

correcting means for correcting resist pattern data based on the displacement detected by the detecting means so that the mirror image relationship will be maintained between the resist patterns when the resist patterns are formed on both sides of the substrate by inkjetting by the inkjet patterning means in  
25 accordance with the resist pattern data.

13. A pattern drawing apparatus as claimed in claim 12, wherein the detecting means includes an image capturing means for capturing images on the test  
30 substrate from one side thereof, and wherein

the test substrate comprises a panel that transmits light.

14. A pattern drawing apparatus as claimed in claim  
35 10, wherein the resist patterns are lead patterns of a leadframe member.

15. A pattern drawing method for forming exposure

patterns that have a mirror image relationship to each other with respect to a substrate on both sides of the substrate, comprising:

5 a maskless exposure step for forming the exposure patterns on both sides of the substrate by using a maskless exposure means and by masklessly exposing both sides of the substrate in accordance with prescribed data.

10 16. A pattern drawing method as claimed in claim 15, wherein the maskless exposure means includes exposure heads arranged facing each other, and wherein

the substrate is placed with each side thereof facing a corresponding one of the exposure heads so that both sides of the substrate are masklessly exposed.

15 17. A pattern drawing method as claimed in claim 15, wherein the exposure patterns are lead patterns of a leadframe member.

20 18. A pattern drawing method for forming exposure patterns that have a mirror image relationship to each other with respect to a substrate on both sides of the substrate, comprising:

a test exposure step for forming test exposure patterns on both sides of a test substrate by masklessly exposing both sides of the test substrate by using a maskless exposure means;

25 a detection step for detecting a displacement from the mirror image relationship of the test exposure patterns by using the test substrate on both sides of which the test exposure patterns are formed by the maskless exposure means;

30 a correction step for correcting exposure data based on the displacement detected in the detecting step so that the mirror image relationship will be maintained between the exposure patterns when the exposure patterns are formed on both sides of the substrate by maskless exposure by the maskless exposure

means in accordance with the exposure data; and

5 a production exposure step for forming the exposure patterns on both sides of the substrate by performing maskless exposure using the maskless exposure means, based on the corrected exposure data obtained in the correction step.

10 19. A pattern drawing method as claimed in claim 18, wherein the maskless exposure means includes exposure heads arranged facing each other, and wherein the substrate is placed with each side thereof facing a corresponding one of the exposure heads so that both sides of the substrate are masklessly exposed.

15 20. A pattern drawing method as claimed in claim 18, wherein the detection step includes a developing step for developing both sides of the test substrate after the test exposure step, and wherein

20 the displacement from the mirror image relationship is detected by reading the exposure patterns that are formed on both sides of the test substrate in the developing step.

21. A pattern drawing method as claimed in claim 20, wherein the detecting step includes:

25 an image capturing step for capturing images on the test substrate from one side thereof; and

a control step for controlling the test substrate in such a manner as to block light during the exposure in the test exposure step and to transmit light during the image capturing in the image capturing step.

30 22. A pattern drawing method as claimed in claim 21, wherein the test substrate comprises a liquid crystal panel having a structure such that light projected from an exposure light source is prevented from being transmitted through the liquid crystal panel during the exposure in the test exposure step, and such that transmittance to inspection light is high during the image capturing in the image capturing step.

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23. A pattern drawing method as claimed in claim 20, wherein the detecting step includes an image capturing step for capturing images on the test substrate from one side thereof, and wherein

5                   the test substrate blocks light during the exposure in the test exposure step and transmits light during the image capturing in the image capturing step.

24. A pattern drawing method as claimed in claim 23, wherein the test substrate comprises a liquid crystal  
10                   panel having a structure such that light projected from an exposure light source is prevented from being transmitted through the liquid crystal panel during the exposure in the test exposure step, and such that transmittance to inspection light is high during the  
15                   image capturing in the image capturing step.

25. A pattern drawing method as claimed in claim 18, wherein the exposure patterns are lead patterns of a leadframe member.

26. A pattern drawing method for forming resist  
20                   patterns that have a mirror image relationship to each other with respect to a substrate on both sides of the substrate, comprising:

                  a patterning step for forming the resist  
25                   patterns on both sides of the substrate by drawing the patterns by using an inkjetting patterning means on both sides of the substrate in accordance with prescribed data.

27. A pattern drawing method as claimed in claim 26, wherein the inkjet patterning means includes inkjet  
30                   heads arranged facing each other, and wherein

                  the substrate is placed with each side thereof facing a corresponding one of the inkjet heads so that the resist patterns are drawn on both sides of the substrate.

35                   28. A pattern drawing method as claimed in claim 26, wherein the resist patterns are lead patterns of a leadframe member.

29. A pattern drawing method for forming resist patterns that have a mirror image relationship to each other with respect to a substrate on both sides of the substrate, comprising:

5                   a test patterning step for forming test resist patterns on both sides of a test substrate by drawing the patterns on both sides of the test substrate by using an inkjet patterning means;

10                   a detection step for detecting a displacement from the mirror image relationship of the test resist patterns by using the test substrate on both sides of which the test resist patterns are formed by the inkjet patterning means;

15                   a correction step for correcting resist pattern data based on the displacement detected in the detecting step so that the mirror image relationship will be maintained between the resist patterns when the resist patterns are formed on both sides of the substrate by inkjetting by the inkjet patterning means in accordance  
20 with the resist pattern data; and

                  a production patterning step for forming the resist patterns on both sides of the substrate by drawing the patterns using the inkjet patterning means, based on the corrected resist pattern data obtained in  
25 the correction step.

30. A pattern drawing method as claimed in claim 29, wherein the inkjet patterning means includes inkjet heads arranged facing each other, and wherein

30                   the substrate is placed with each side thereof facing a corresponding one of the inkjet heads so that the resist patterns are drawn on both sides of the substrate.

31. A pattern drawing method as claimed in claim 29, wherein the detecting step includes an image  
35 capturing step for capturing images on the test substrate from one side thereof, and wherein

                  the test substrate comprises a panel that

transmits light.

32. A pattern drawing method as claimed in claim 29, wherein the resist patterns are lead patterns of a leadframe member.

- 5           33. A test apparatus for use in a pattern drawing apparatus for forming exposure patterns that have a mirror image relationship to each other with respect to a substrate on both sides of the substrate; comprising
- 10                   maskless exposure means, having exposure heads arranged facing each other, for masklessly exposing both sides of the substrate by sandwiching the substrate to be exposed between the exposure heads;
- 15                   a test substrate that blocks or transmits light, and on both sides of which test exposure patterns are formed by maskless exposure using the maskless exposure means;
- developing means for developing both sides of the test substrate on which the test exposure patterns have been formed by exposure;
- 20                   image capturing means for capturing images on the test substrate from one side thereof after the exposure patterns have been formed thereon by the developing means;
- 25                   control means for controlling the test substrate in such a manner as to block light during the exposure by the exposure means and to transmit light during the image capturing by the image capturing means; and
- 30                   detecting means for detecting a displacement from the mirror image relationship of the test exposure patterns on the test substrate, based on the images captured by the image capturing means.
- 35           34. A test apparatus as claimed in claim 33, wherein the test substrate has a structure such that light projected thereon is prevented from being transmitted therethrough during the exposure by the exposure means, and such that transmittance to inspection



light is high during the image capturing by the image capturing means.

5       35. A test apparatus as claimed in claim 33, wherein the test substrate comprises a liquid crystal panel having a structure such that light projected thereon is prevented from being transmitted therethrough during the exposure by the exposure means, and such that transmittance to inspection light is high during the image capturing by the image capturing means.

10       36. A test apparatus as claimed in claim 33, further comprising correcting means for correcting exposure data based on the displacement detected by the detecting means so that the mirror image relationship will be maintained between the exposure patterns when the  
15       exposure patterns are formed on both sides of the substrate by maskless exposure by the maskless exposure means in accordance with the exposure data.

20       37. A test apparatus for use in a pattern drawing apparatus for forming resist patterns that have a mirror image relationship to each other with respect to a substrate on both sides of the substrate; comprising  
      inkjet patterning means, having inkjet heads arranged facing each other, for drawing the resist patterns on both sides of the substrate by sandwiching  
25       the substrate between the inkjet heads;

      a test substrate which comprises a light transmitting panel, and on both sides of which test resist patterns are formed by pattern drawing using the inkjet patterning means;

30       image capturing means for capturing images on the test substrate from one side thereof after the test resist patterns have been formed thereon; and

      detecting means for detecting a displacement from the mirror image relationship of the  
35       test resist patterns on the test substrate, based on the images captured by the image capturing means.

      38. A test apparatus as claimed in claim 37,

further comprising correcting means for correcting resist  
pattern data based on the displacement detected by the  
detecting means so that the mirror image relationship  
will be maintained between the resist patterns when the  
5 resist patterns are formed on both sides of the substrate  
by pattern drawing by the inkjet patterning means in  
accordance with the resist pattern data.